Entergy

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October 24, 2002
BVY 02-85

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Subject: **Vermont Yankee Nuclear Power Station**
License No. DPR-28 (Docket No. 50-271)
Reportable Occurrence No. LER 2002-001, Rev. 0.

As defined by 10CFR50.73, we are reporting the attached Reportable Occurrence LER 2002-001, Rev. 0.

Sincerely,

ENTERGY NUCLEAR OPERATIONS, INC.
VERMONT YANKEE

Kevin H. Bronson
General Manager

cc: USNRC Region I Administrator
USNRC Resident Inspector - VYNPS
USNRC Project Manager - VYNPS
Vermont Department of Public Service

IE22

NRC FORM 366 (2-2001) U.S NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

APPROVED BY OMB NO. 3150-0104 EXPIRES 7-31-2004

Estimated burden per response to comply with this mandatory information collection request. 50 hours Reported lessons learned are incorporated into the licensing process and fed back to industry Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U S Nuclear Regulatory Commission, Washington, DC 20555-0001, or by Internet e-mail to bis1@nrc gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104) Office of Management and Budget, Washington, DC 20503 If a means used to impose information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
VERMONT YANKEE NUCLEAR POWER STATION (VY)	05000271	1 of 3

4. TITLE

Core Thermal Power Exceeded due to a Non-Conservative Moisture Carryover Assumption

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									N/A	05000 -
09	05	2002	2002	- 001	- 00	10	24	2002	FACILITY NAME N/A	DOCKET NUMBER 05000 -

9. OPERATING MODE	N	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)			
10. POWER LEVEL	100	☐ 20 2201(b)	☐ 20 2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(ix)(A)
		☐ 20.2201(d)	☐ 20 2203(a)(4)	☐ 50 73(a)(2)(iii)	☐ 50.73(a)(2)(x)
		☐ 20.2203(a)(1)	☐ 50 36(c)(1)(i)(A)	☐ 50 73(a)(2)(iv)(A)	☐ 73.71(a)(4)
		☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(v)(A)	☐ 73 71(a)(5)
		☐ 20.2203(a)(2)(ii)	☐ 50 36(c)(2)	☐ 50 73(a)(2)(v)(B)	☒ OTHER Specify in Abstract below or in NRC Form 366A
		☐ 20.2203(a)(2)(iii)	☐ 50 46(a)(3)(ii)	☐ 50 73(a)(2)(v)(C)	License Condition g.3.A Exceeded (Voluntary)
		☐ 20.2203(a)(2)(iv)	☐ 50 73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(D)	
		☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(B)	☐ 50 73(a)(2)(vii)	
		☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(C)	☐ 50 73(a)(2)(viii)(A)	
		☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(ii)(A)	☐ 50 73(a)(2)(viii)(B)	

12. LICENSEE CONTACT FOR THIS LER

NAME	TELEPHONE NUMBER (Include Area Code)
Kevin Bronson, General Manager	(802) 257-7711

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
N/A					N/A				

14. SUPPLEMENTAL REPORT EXPECTED			15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
☐	YES (If yes, complete EXPECTED SUBMISSION DATE)	☒ NO		N/A	N/A	N/A

16. ABSTRACT (Limit to 1400 spaces, i e., approximately 15 single-spaced typewritten lines)

On 10/03/01, as a result of information received from General Electric Nuclear Energy (GENE) in September of 2001, it was determined that Vermont Yankee (VY) had potentially been operating slightly above its licensed Maximum Power Level as set forth in License Condition g.3.A. A moisture carryover fraction of 0.1% had been used from previous guidance by GENE. On 10/03/01 this value was changed to 0.0% in VY's calorimetric calculation model, pending the determination of an actual average moisture carryover content value. On 09/05/02, it was determined that the average moisture carryover fraction was approximately 0.029%; therefore core power may have been exceeded by approximately 1 Megawatt-thermal (MWth), which correlates to 0.06% of the Maximum Power Level. Use of the non-conservative moisture carryover fraction of 0.1% does not represent a safety issue. The change in core thermal power is an order of magnitude less than the precision of the MCPR safety limit evaluation process and is enveloped by the allowed uncertainties in the evaluation process and computer core thermal power estimate. The cause of this event is the failure to empirically determine the value of the percentage of moisture carry-over present once the plant became operational, and subsequent use of a design assumption in determining Core Heat Balance.

LICENSEE EVENT REPORT (LER)

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VERMONT YANKEE NUCLEAR POWER STATION (VY)	05000271	2002 --	001 --	00	2 OF 3

NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)* **(17)**

DESCRIPTION:

On October 3, 2001, as a result of proprietary information received from General Electric Nuclear Energy (GENE) in a September of 2001 publication entitled "Impact of Steam Carryover Fraction on Process Computer Heat Balance Calculations", it was determined that the potential existed that Vermont Yankee (VY) had been operating slightly above its Maximum Power Level of 1593 MWth as established in License Condition g.3.A. A moisture carryover fraction of 0.1% had been used from previous guidance by GENE. On 10/03/01, this value was changed to 0.0% in VY's calorimetric calculation model pending the determination of an actual value for the average moisture carryover fraction from the Chemistry Department. On September 5, 2002, Chemistry concluded that the average moisture carryover fraction for VY was approximately 0.029%. Based on these results, core thermal power may have been exceeded by approximately 1 MWth (which correlates to 0.06% of the Maximum Power Level) prior to reversion to 0.0% on October 3, 2001.

ANALYSIS:

During the design of VY, the designers assumed there would be some moisture carried down the Main Steam lines during normal operations. This amount was estimated to be 0.2% of the mass of the steam flow. There is no documentation that proves this value was ever verified during preoperational testing of the plant. After VY became operational, this value was reduced to 0.1%. This reduction was in the conservative direction with regard to core thermal power (reduced moisture carry-over in the main steam lines would cause calculated core thermal power to be higher). It was judged that the real value of moisture carry-over would not cause a significant difference in the calculation of core thermal power. For example, if moisture carry-over were 0.0%, the effect of this change would result in core thermal power being underestimated by approximately 1.3 Megawatts-thermal. This difference would produce a bias in the estimation of core thermal power of 0.08% at full power.

In November of 2001, GENE produced SIL #639, that determined through natural Sodium-24 testing in several BWR/3 plants that the amount of moisture being carried over in the main steam lines is 0.11%, with a standard deviation of 0.06%. This study indicated that the amount of carry-over was functionally dependent on several parameters. These parameters include Power Level, Control Rod Pattern and Steam Dryer design. GENE stated that the use of the value of 0.1%, while it may be non-conservative, would not represent a safety issue since the error produced is on an order of magnitude less than the uncertainty of the MCPR safety limit evaluation. A bias in the carryover fraction of 0.1% in the core thermal power evaluation represents a small increase (less than 1%) in the probability that core thermal power will exceed the nominal rated power by more than 2%. GENE consequentially recommended that a value of 0.0% for moisture carry-over be used in the core thermal power calculation in the absence of an actual measured value.

On September 5, 2002 the VY Chemistry Department determined, through the use of the natural Sodium-24 technique, that the average amount of moisture carried over in the main steam lines was 0.029% of the total mass flow rate. The effect of the difference between the estimated and the measured carry-over would be to under-estimate core thermal power by appoximately 1.0 MWth (which correlates to 0.06% of the Maximum Power Level). As a result, the core thermal power calulation has remained as modified on 10/03/01 to calculate core thermal power assuming that moisture carry-over is 0.0%.

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NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)* **(17)**

CAUSE:

The root cause of this event is the failure to empirically determine the value of the percentage of moisture carry-over present when the plant became operational, and the subsequent use of a design assumption in determining Core Heat Balance.

CORRECTIVE ACTIONS:

1. The constant used in the calculation of the Core Thermal Power was adjusted to be 0.0% moisture carryover. This partially corrects the root cause. Complete.

2. The average value of moisture carryover from the reactor was empirically determined to be 0.029%. This action, in conjunction with corrective action number one, corrects the root cause. Complete.

ASSESSMENT OF SAFETY CONSEQUENCES:

As stated in GE SIL No. 639, use of the moisture content of 0.1%, while non-conservative in determining core thermal power if actual moisture content is lower, does not represent a safety issue. This change in core thermal power is an order of magnitude less than the uncertainty in the MCPR safety limit evaluation and has no significant effect on safety analyses. This condition did not have the potential to cause fuel thermal limits to be exceeded. Therefore, there was no increased risk with respect to the health and safety of the public.

ADDITIONAL INFORMATION:

Two events have been identified during the past five years in which core thermal power limits have been exceeded. The corrective actions prescribed in these LERs would not have prevented the overpower conditon described in this event since the moisture carry-over fraction was an assumed input provided by GE.

LER	Event Report Date	Event Title
2001-004-00	08/21/01	Exceeded Core Thermal Power Limit Due to Feedwater Nozzle Fouling
97-017-00	10/19/01	An Equipment Malfunction Remaining Undetected by the Operating Crew Results in Plant Operation in Excess of Rated Thermal Power.